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Article

The mesolithic at Mura cave

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Key words

- Grotta delle Mura
- Mesolithic
- Sauveterrian
- typology
- lithic technology
- reduction sequence

Parole chiave

- Grotta delle Mura
- Mesolitico
- Sauveterriano
- tipologia
- tecnologia litica
- catene operative

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Summary

Mura Cave is located along the shoreline of the southern part of the suburban area of Monopoli (Bari, Italy). The archaeological excavation was focused on a 21 square area and the stratigraphic sequence ranged from Mousterian to ancient Neolithic. The project aim was to analyze the Mesolithic phase (Layer 2), which was located between two other layers, one related to the final Epigravettian and the other related to the Neolithic. Some pebble mobiliary art and bone artifacts were found. There was a rich lithic industry, comprising 5000 unretouched artifacts, 1100 retouched tools and 34 cores. The lithic technology was typical Sauveterrian, essentially structured on prismatic and discoidal cores. The typological analyses revealed a Sauveterrian structure mixed with some Epigravettian local features.

Riassunto

Il sito di Grotta delle Mura è situato lungo la costa all'interno del reticolo urbano della cittadina di Monopoli (Bari). Le ricerche archeologiche interessano un'area 21 metri quadri ed una sequenza stratigrafica estesa tra il Musteriano ed il Neolitico antico. Quì è presentato lo studio relativo alla fase di frequentazione mesolitica (strato 2), successiva ad un livello (strato 3) relazionabile all'Epigravettiano romanelliano, ed uno superiore neolitico. Dallo strato provengo alcuni reperti di arte mobiliare, industria su osso, reperti faunistici ed una notevole quantità di industria litica. Questa ultima si compone da circa 5000 supporti non ritoccati, 1100 strumenti ritoccati e 34 nuclei. La tecnologia litica risulta essere sauveterriana, basata essenzialmente sullo sfruttamento di piccoli nuclei prismatici e discoidali, mentre in leggero contrasto le strutture tipologiche delineano un contesto mesolitico dove i caratteri epigravettiani tipici dell'areale geografico sud-adriatico non sono ancora svaniti.

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The site

An introduction

Grotta delle Mura is situated along the shoreline of a suburban area of the small town of Monopoli (Bari, Italy) (Fig. 1). The site has been the subject of archaeological investigation since 1950, thanks to Professor Franco Anelli (1952)(Cornaggia Castiglioni 1960; Calattini 1986a). The present excavation extended to 20 m2, is subdivided into three different areas: A, B and C (Fig. 2). The stratigraphic succession consisted principally of seven layers, chronologically extending from the middle Paleolithic to the Neolithic (Calattini 2005) (Fig. 3):

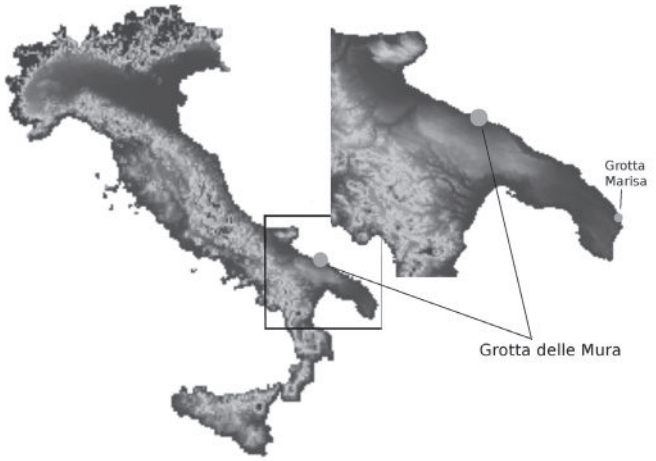

Fig. 1 *- Geographic location of Grotta delle Mura. / Posizione geografica di Grotta delle Mura.*

- Clay soil without archaeological artifacts (Layer A).
- Ancient Neolithic (Layer 1) (Calattini and Greco 2000) .
- Sauveterrian Mesolithic (8240 +/-120 BP) (Layer 2 and US 124) .
- Final Epigravettian (Romanelliano) (10540 +/- 140BP, 10850 +/- 100 BP)(Layer 3 and US 125-129) (Calattini 2005).
- Evoluted Epigravettian (US 141).
- Ancient Epigravettian (15860 +/- 80 BP) (Layer 4 and US 142-143).
- Mousterian (44530 +/- 2040 BP)(Layer 5).

The aim of this work is largely related to Layer 2, for which three articles have been published previously; the first two publications were short notes related to area A (Calattini 1996a, 1996b) and the third publication a typological study of the lithic assemblage from Area B (Calattini and Morabito 2006). Layer 2 had a maximum thickness of 60 cm and an area of 12 m2. During the excavation it was subdivided into 15 sub-levels of different thickness as a result of the friability of the sediment, which was harder in the lower part (levels 15–8) and softer in the upper parts (levels 7–1). No convincing structures were found. We obtained two radiometric dates for Layer 2, one from the upper part of the layer and the other from the lower part; they are, respectively, 8290+/50BP (Utc1417) and 8240+/-120 BP (Utc 780).1 Analysis of the macro- and micro-fauna suggested a humid, temperate climate, characterized, respectively, by the predominance of Bos primigenius and the rare presence of equidae (Bon, Boscato 2003) and the presence of Heliomys and Crocidura. The upper part of the layer indicated an increasing of forest coverage. There is also an abundant malacological fauna, with predominantly ter-

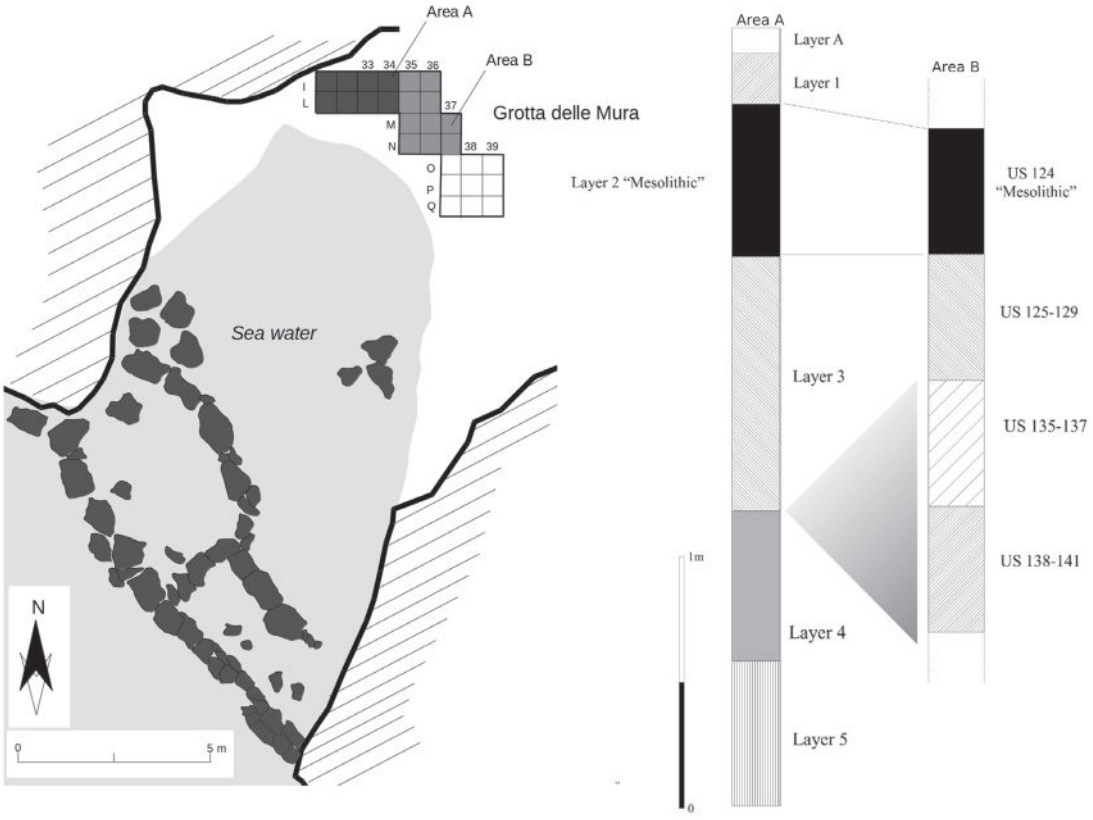

Fig. 2 *- Archaeological context of Area A and B and logs of stratigraphic successions of Area A and B. / Mappa del sito e schema stratigrafico dell'area A e B.*

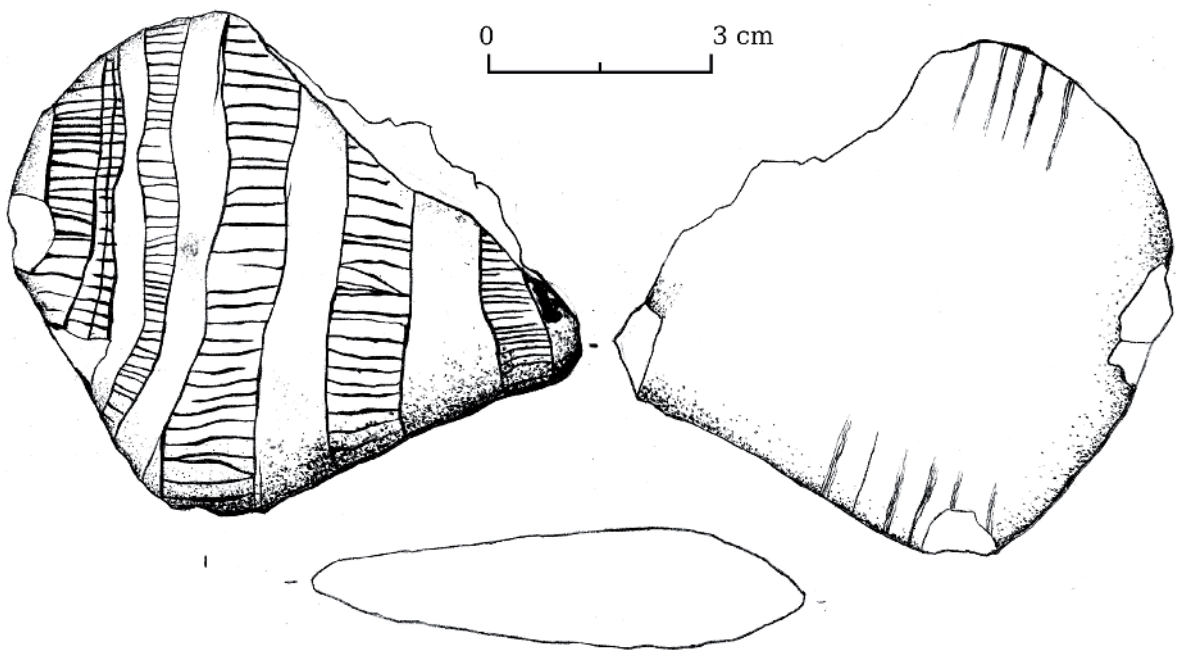

Fig. 3 - Engraved stone from Layer 2. (Drawing by C. Tessaro). / Ciottolo inciso proveniente dallo strato 2. (Dis. di C. Tessaro).

restrial but also maritime species present. The terrestrial species are principally Eubania vermiculata and Rumina decollata, and the maritime species Patella caerulea and Monodonta turbinata. All the evidence suggests the climate was tending towards the temperate phase of the Boreal period.

Mobiliary art and bone working

Several pieces of mobiliary art were found in Layer 2, three of which are linear engraved pebbles defined by a particular scale line pattern. One pebble is engraved on both sides and another only over one face. The first pebble is 50 mm in length, 45 mm in width and 15 mm thick; it is decorated on both faces and on one of the edges. On the first side, the decorative syntax consistes of three more or less parallel bundles, with two deep external strokes filled by thinner lines, perpendicular to the outline. On the edge, simple sub-parallel lines could be seen, while on the second side of the pebble there is an association of parallel lines and, possibly, a chevron pattern, which is only partially visible. The second pebble, a calcarenite pebble, has a length of 45 mm, width of 40 mm and thickness of 25 mm; one side has the same decorative syntax as the first pebble, i.e. bundles with two external lines filled by thinner strokes. The third limestone pebble (Fig. 3) has a length of 70 mm, width of 65 mm and thickness of 17 mm, and shows traces of exposure to heat. Engravings are present on both sides; on the first side, there are five bundles like the ones described above, while on the other side there are only simple parallel strokes. It is important to note that all the engraved pebbles found in this layer were intentionally broken ab antiquo; this phenomenon has been observed before, at Grotta delle Veneri di Parabita (Apulia) and interpreted as ritual activity (Cremonesi 1987, pp. 35–46). Evidences of bone working are scarce, comprising a spatula made from an animal vertebra and two awls of different size and shape. Two bone pendants were also found, made from deer atrophic canines (Fig. 4).

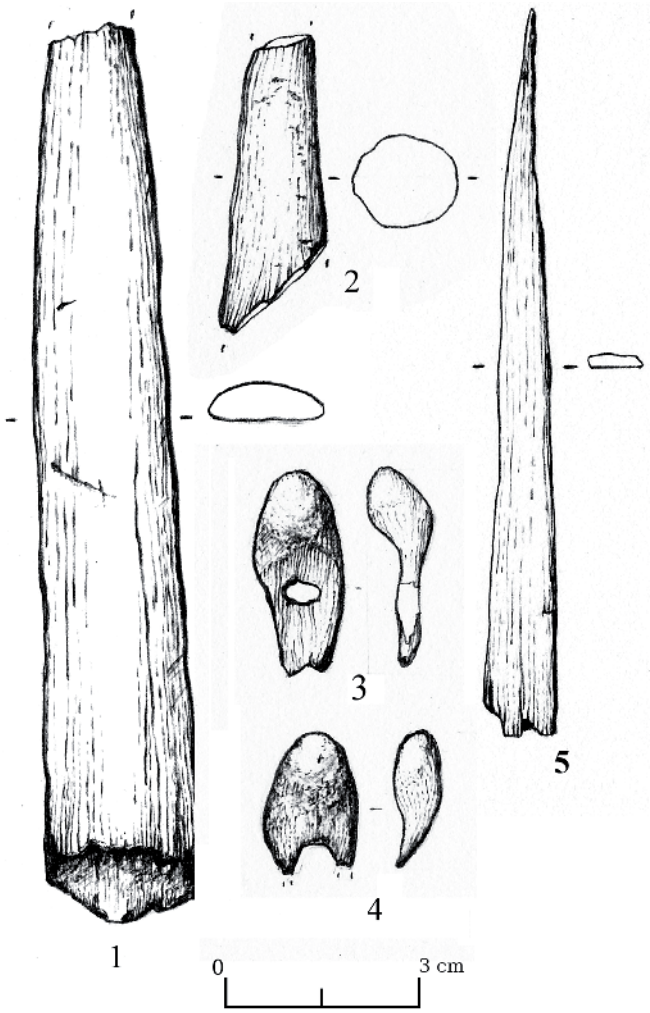

Fig. 4 - Bone industry – layer 2. Awls (1, 2 e 5), pendants (3 and 4). (Drawings by C. Tessaro). / Industria su osso relativa allo strato 2. Punteruoli (1, 2 e 5), pendagli (3 e 4). (Dis. di C. Tessaro).

Tab. 1 - Basic composition of the assemblage. / Composizione dell'insieme litico.

	CORES		FLAKES		BLADES		RETOUCHED T.		DEBRIS		TOT.
	N	%	N	%	N	%	N	%	N	%	N
Layer 2 (7-1)	15	0.2	59	0.8	97	1.3	485	6.7	6602	91.5	7258
Layer 2 (15-8)	19	0.3	158	2.8	286	5.1	670	12.0	4429	79.6	5562
Total Layer 2	34	0.3	217	1.7	383	6.5	1150	9.0	11031	86.3	12820

Tab. 2 - Shaping blanks (total 58). / Supporti di relativi alla messa in forma dei nuclei (tot. 58).

CLASSES	15-8	7-1
Opening blades	1.7%	8.2%
Opening flakes	30.6%	32.7%
Crested blades	15.5%	0.0%
Partial crested blades	10.3%	20.4%
Generic cortical flakes	6.7%	30.6%
Tot.	**29**	**28**

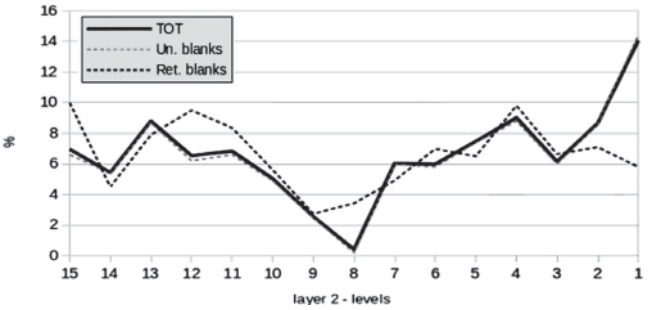

Fig. 5 - Lithic artifact vertical distribution in layer 2. / Distribuzione dei reperti litici per tagli nello strato 2.

Tab. 3 - Production/Maintenance blanks in Layer 2. / Supporti relativi alla fase di messa in forma/produzione (strato 2).

CLASSES	LAYER 2
Opening platf.	0.7%
Surbaissé	2.1%
Rejuvenation	2.81%
Demi-tablette	1.41%
Neo-crested blade	1.0%
Tablette	0.7%
Cortical backed flake	2.1%
Backed flake	1.4%
Flake	69.5%
Backed blade on edge	5.9%
Cortical backed blade	2.1%
Backed blade	10.0%
Tot.	**289**

Lithic industry

Analysis of the lithic assemblage was carried out following the stratigraphic division of Layer 2 into 15 sub-levels. The artifacts come from the whole excavated area. Quantitatively, the lithic industry is very rich, comprising 12820 artifacts made up of 34 cores, 217 flakes, 383 blades, 1155 retouched tools and 11,031 debris2 fragments. These data with a preliminary comparison of the debitage products define a depth quantitative gap between the categories of the lithic set, surely a consequence of high degree of reduction by retouch (Tab. 1). The unique exploited raw material are a good quality flint. The analysis of the cortical surfaces shows that a type of flint presumably was collected locally, in this case they are small pebbles, in the other one slabs/block coming probably from the Gargano area. The microburin technique is present: 47 elements in total, 26 for levels 15-8 and 21 for levels 7-1. They are generally ordinary types of microburins, the Krukowski type is quite rare, only four. The use of this technique is quite common at Grotta delle Mura, with a ratio armatures/microburins equal to 5.23 (levels 15-8) and 7.0 (levels 7-1).

In order to verify the hypothetical subdivision of Layer 2, we considered the vertical distribution of the frequency of artefacts in each level and we confirmed the division of the layer into two distinct sets, one comprising levels 15–8, with a peak frequency in in level 13, and the other one comprising levels 7–1, with a peak in level 1 (Fig. 5).

Technology

Because of the high degree of blank modification,3 the absence of lithic artefacts related to a peculiar phase of the chaine operatoires and, in consequence the complete absence of refitting, an accurate analysis of morpho-techno-metrical features of the cores and unretouched blanks was carried out. This gave us sufficient data to interpret the reduction sequence.

The first phase of the debitage, the shaping of the cores, is only indicated by a very small number of artifacts (a total of 57 for the whole of Layer 2) (Tab. 2). The principal categories are generic flakes, related to the making of striking platforms, and some half-cortical blades, related to the working of small pre-shaped blocks of flint. In the upper part of the layer (levels 7–1) there is an increase in generic cortical flakes, a consequence of more intensive management of small flint pebbles, confirmed with analysis of the cortical surfaces. This kind of raw material, identified from the remaining cortex, increased from 9% in levels 15–8 to 50% in levels 7–1 of artifacts. What must be emphasized are the low frequencies of half cortical flakes (0.1%–0.2%), corresponding to the opening of new knapping surfaces on pre-used cores. It seems that the first phase of shaping the raw material is completely absent at this site.

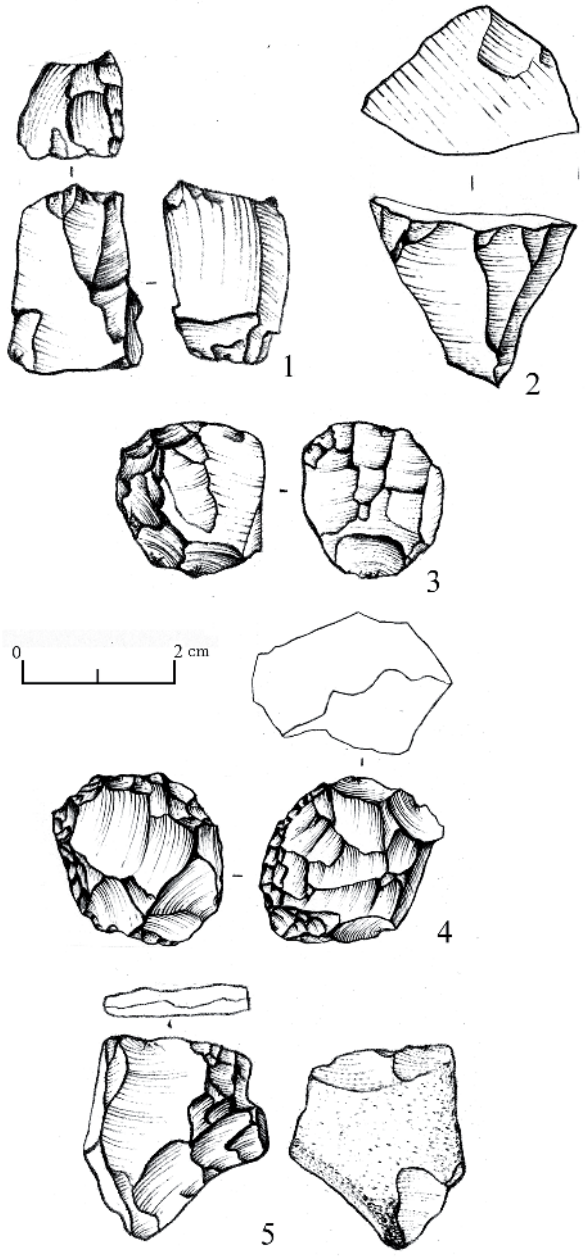

Fig. 6 - Cores of layer 2: class III (1-2), class VII (3), class V (5), class VII (4).(Drawings by C. Tessaro). / Nuclei dello strato 2: classe III (1-2), classe VII (3), classe V (5), classe VII (4). (Dis. di C. Tessaro).

In the blank production phase, only lamellar blanks, or ones for which the intended function is certain, are included for analysis. Regarding the orientation of removal, blanks with unidirectional removal dominated throughout the sequence (94.3%–93.91%), while the number of blanks showing oblique and convergent/oblique removal remained constantly low or absent (around 0.1%–0.9%). The double ventral definition is essentially related to blanks that resulted from the management of flake/discoidal cores (2.25%–3%). The analysis also includes a category of artifacts comprising generic blanks or technical blanks, generally related to production/management processes. The generic flakes are more frequent throughout Layer 2, backed blanks or centering blades are very rare, as are flakes showing lateral and transverse convexity; crested blade and neo-crested blades are also very rare (Tab. 3).

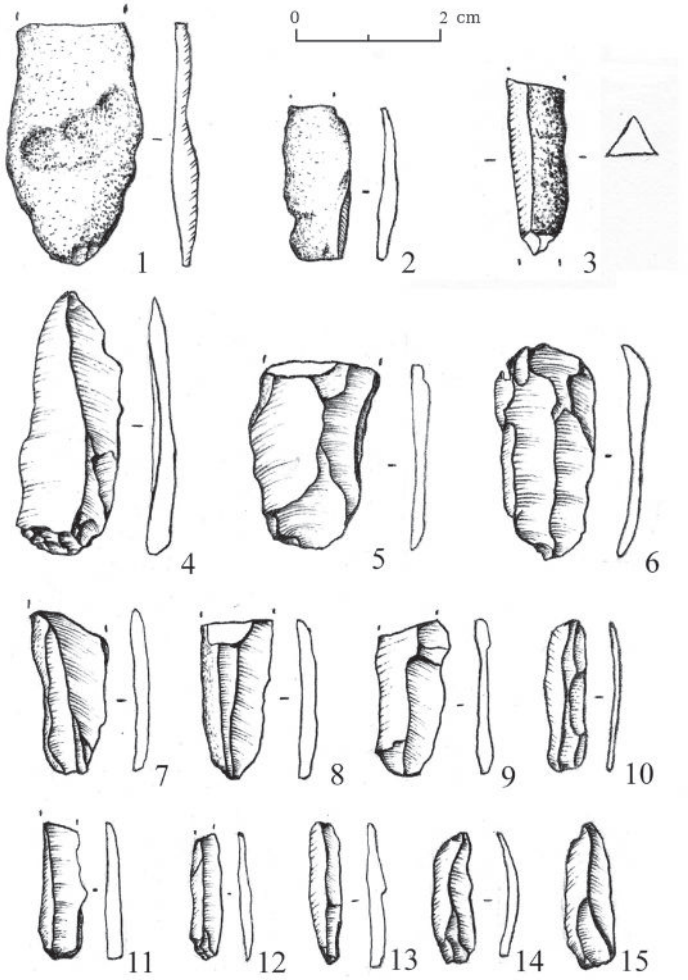

Fig. 7 - Unretouched lamellar blanks. Cortical (1-2), on natural edge - half cortical (3), bladelets (4-5), micro-bladelets (7-9) and iper-micro-bladelets (10-15). (Drawings by C. Tessaro). / Supporti lamellari non ritoccati. Corticali (1,2), semi corticali (3), lamelle (4,5), micro-lamelle (7 – 9), iper-micro-lamelle (10 – 15). (Disegni di C. Tessaro).

Cores

There are not many cores in Layer 2 (Fig. 6), with a total of just 34, and the same types are generally present in the lower levels as in the upper levels of the layer. It is present also a reuse of an exhausted polihedrical core such an hammer, the maximum dimension is 35 mm. The following typological subdivision is based on the proposed classification for Romagnano III (Broglio & Kozlowski 1983).

- Pre-cores (class I): absent from all levels.
- Sub-conic bladelet cores with one stricking platform (class II): six here in levels 15–8 but only one in the upper levels. All the artifacts are very small, being between 10 and 26 mm in length. The morphology of the artifacts is not standardized, principally because of the selection of different raw materials. The types selected are generally small blocks of flint, slabs, small pebbles or thick cortical flakes. Some cores showed a re-orientation of the debitage surfaces, with a sequence of detachment usually semi-tournant, or facial, with two or four lamellar negatives.
- Subconical bladelets cores (class III): not many, only one in the lower part of the layer and two in the upper part. Like the other types, they are also small, usually obtained from thick cortical flakes. The lamellar detachment always started from non-prepared knapping surfaces, but the use tended to be more intense, with a sequence of rejuvenation of the knapping surface, and usually

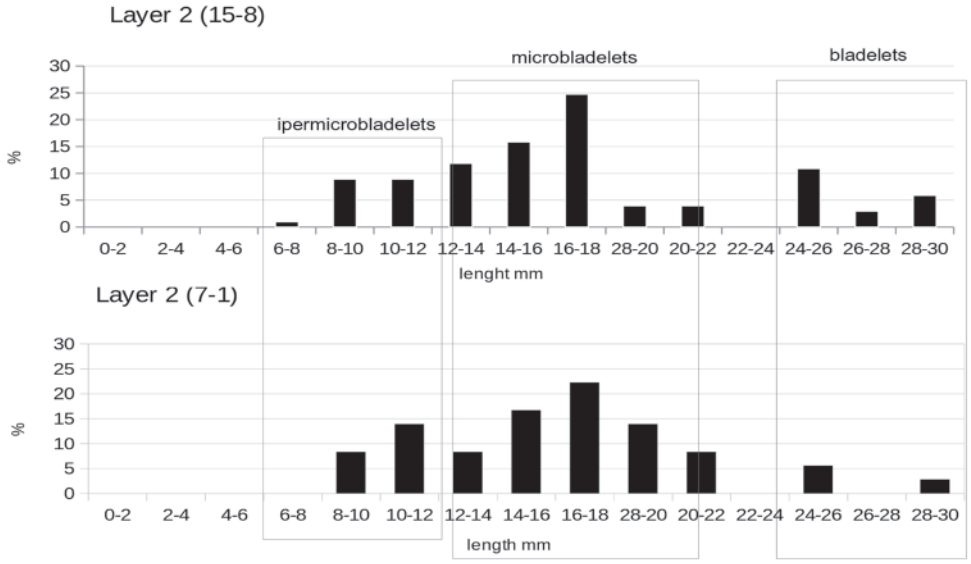

Fig. 8 - Charts of frequency of unretouched lamellar blanks by length. / Grafici relativi alle frequenze della lunghezza dei supporti lamellari non ritoccati.

with the start of a new one on the opposite, transverse part of the core. The abandoned surface is always related to exhaustion of the useful volume of the artifacts from the lamellar debitage. We generally found intensive exploitation of the knapping surface that tended to transform the stricking platform in a line.

- Bladelet cores with two striking platforms (class IV): one element from the level 7-1 with maximum dimension of 67 mm. The two stricking platform are oppose and they are characterized by lamellar detachment, and like all the other cores the exploitation is unipolar (the bipolar knapping is not synchronized). The volumetric exploitation is very intensive.
- Discoidal cores (class V): there are two discoidal cores for microlithic flakes, one in the lower part and the other in the upper part of the layer. Both seems to be derived from a thick cortical flake. The debitage consisted of a series of three to five detachments of very short blanks on the ventral part of the flake, with a stricking platform only partially elaborated.
- On-flake cores (class VI): eight cores are characterized by a poligonal/polihedrical shape, all come from the lower part of Layer 2. They are very small, and the volume completely exhausted, with planes of debitage apparent in every kind of orientation, with the detachment of little, écaille thin flakes.
- Pièces écaillées (class VII): There are only six, and in general their techno-morphological aspects are similar to those of type V. They are very small, with intensive knapping usually on the transverse profile, or all over the perimeter, clearly as a consequence of bipolar percussion on an anvil.
- Elements not clearly identifiable: the volume of seven elements had been exploited to the point that it was impossible to identify the debitage scheme clearly, other than to relate them with one of the previous core classes. All these cores are fragments, three in levels 15-8 and four in levels 7-1.

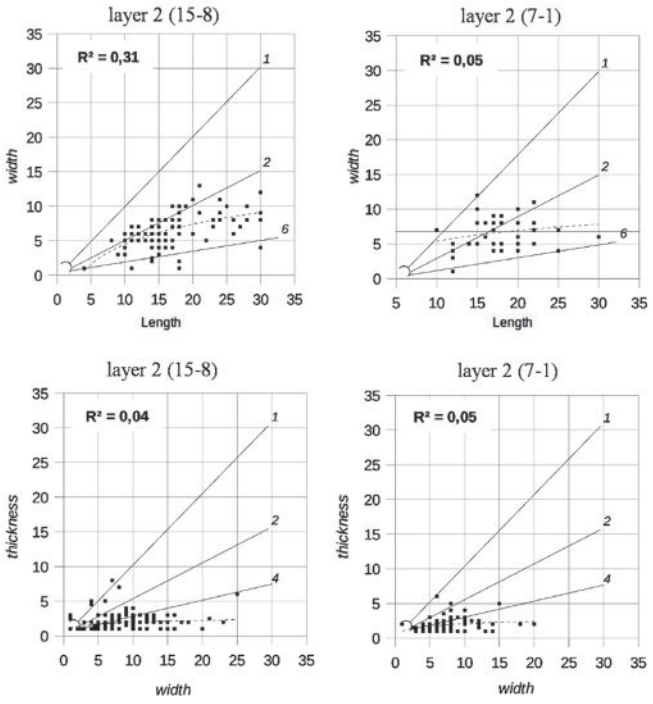

Fig. 9 - Unretouched lamellar blanks correlation graphs (length and width). / Grafici di correlazione relativi alla lunghezza/larghezza dei supporti lamellari.

The lamellar debitage is related only to class II and III cores. For these, the debitage are from the unprepared stricking platform on thick flakes (with cortex present as well), or from small blocks/slabs or flint pebbles. Even though the debitage are very intensive, the sequence of the detachment is short (usually just three to four blanks) and usually facial or semi-tournant. Very frequently there are re-orientation of the core exploitation, with the opening of new debitage surfaces. The discoidal cores related exclusively to the production of flakes/microflakes, usually based on the exploitation of thick flakes. The debitage started with a rough preparation of the stricking platform, and proceeded with the detachment of no more than four blanks, in unipolar, bipolar or centripetal directions.

Typometry of the unretouched blanks

The typometrical analysis was conducted with the aim of defining the debitage. The analysis presented here is concerned only with the unretouched artifacts; the analysis of the blanks did not take into account their specific roles in the reduction sequence, cause it is impossible always to understanding it. Measurements were taken with the help of the minimal rectangle method (Laplace 1977), described separately for the blades, flakes and retouched tools. The lithic assemblage is characterized by an high degree of microlithics, related principally to the unretouched blanks. The artifacts in general are between 6 and 44 mm long, less than 33 mm wide, and less than 20

mm thick. The average and median values are similar, and the standard deviation relatively low, indicating a good morphological standardization of production process, in particular in lower part (levels 15–8). The index length/width statistics of the blades/bladelets mean that the assemblage could be divided into three subsets: iper-micro-bladelets, micro-bladelets and bladelets (Fig. 7–8). In the iper-micro-bladelets class, the blanks are smaller than in the others, with lengths less than 12 mm. The micro-bladelets are between 12 and 22 mm in length, and the bladelets between 24 and 30 mm. The categories are the same in both parts of Layer 2. The correlation of width and thickness confirm previous observations, that there is some morphological standardization of the longitudinal profile of blanks in levels 15–8 and

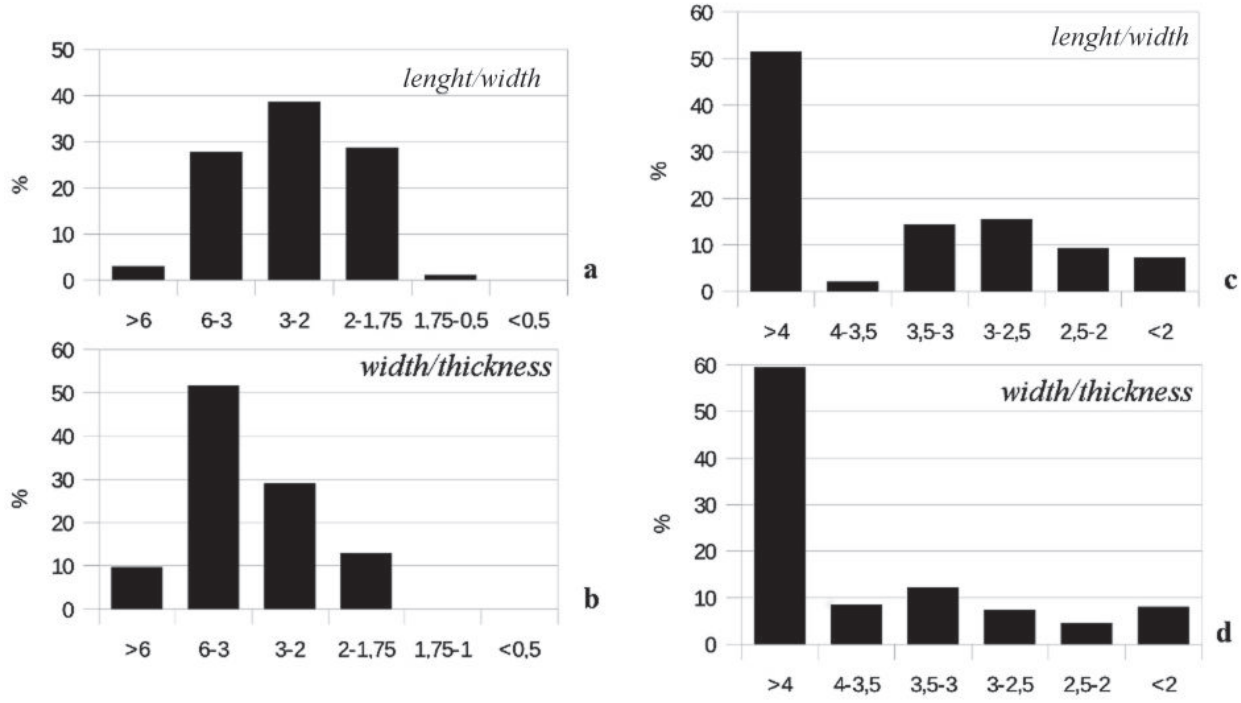

Fig. 10 - Load chart of measure of unretouched lamellar blanks (length/width and width/thickness). / Grafici relativi alla correlazione della larghezza e spessore dei supporti lamellari.

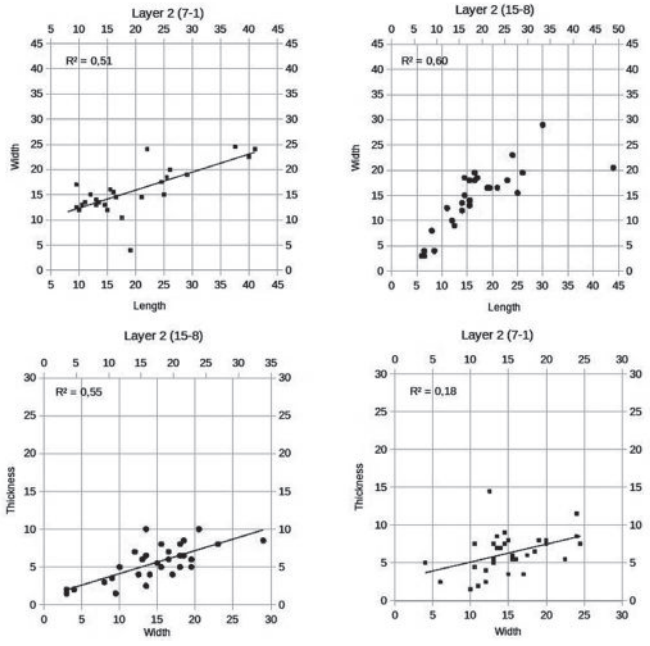

Fig. 11 - End-scrapers correlation graphs. / Grafici di dispersione relativi alla tipometria dei grattatoi.

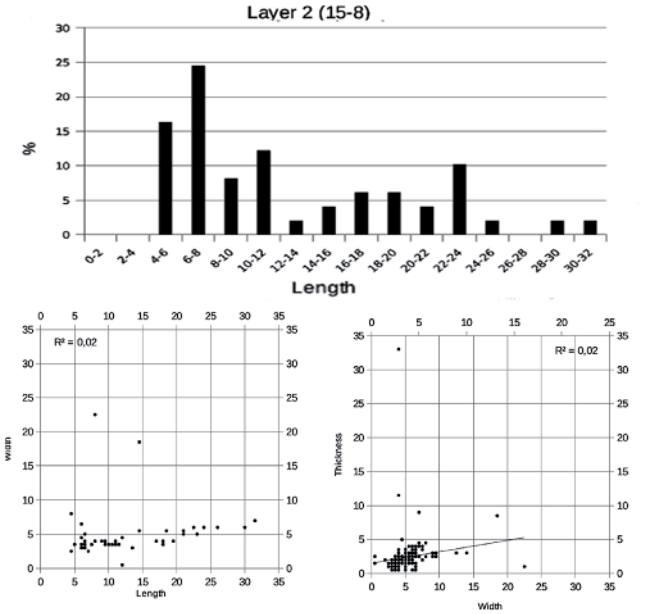

Fig. 12 - Armatures correlation graphs and histograms related to length and width (mm), levels 15 – 8. / Grafici relativi alla tipometria delle armature, tagli 15 – 8.

levels 7–1 (Fig. 9 – 10). In general the shape is usually straight, and the length index (length/width) is on average 3; the bladelets rarely have values higher than 6. The shape of the transversal/longitudinal profile of the blanks are not very standardized, and the blades tended to be irregular or curved. A major trend in standardization could be seen in levels 7–1, with a very low correlation coefficient (0.05).

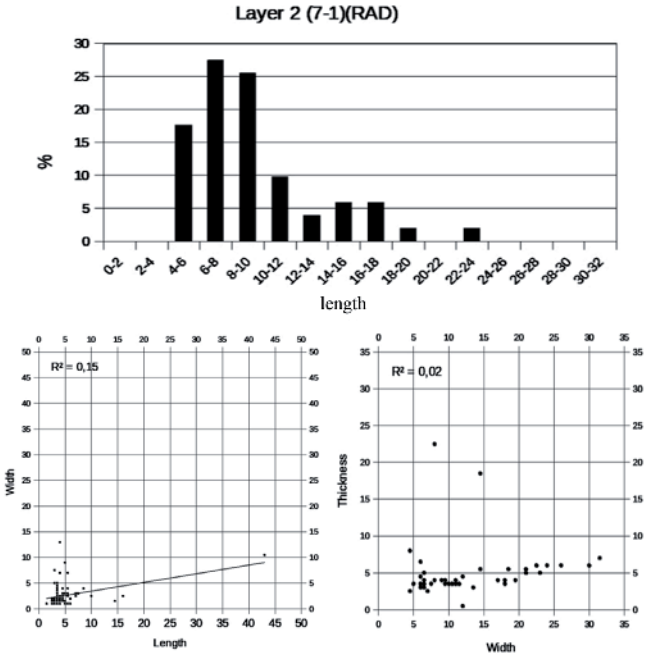

Fig. 13 - Armatures correlation graphs and histograms related to length and width (mm), levels 7 – 1. / Grafici relativi alla tipometria delle armature, tagli 7 – 1.

Retouched tools

Typometry of the retouched artifacts

The typometrical analysis of retouched tools was conducted in order to try and clarify the particular choices for the final artifacts. A strong trend in microlithics is constant across the retouched tools, specifically 50% microlithic and 30% iper-microlithic blades. In general we have 30%–35% blades and 60%–70% flakes, and a consistent number of carenated tools. The common tools have a very low metric standardization, clearly related to the generic morphological variability, and in relation to a uniform choice of tools relative to each phase of the reduction sequence. The values for length are between 4 and 41 mm in levels 15–8, and 3 and 77.5 mm in levels 7–1, with an average of 18.2 and 21.2 mm, respectively. If we only consider the typological group of end-scrapers, the maximum dimension is between 3 and 29 and 8 and 41 mm, respectively, with a corresponding average value of 14.6 and 18.8 mm. In both parts of the layer, regarding the relationship between width and thickness, the trend is similar, with a medium carenage index of about 2.5 mm and a maximum length that rarely exceeded 10 mm, even though the measurements seem to underline a major standardization of shapes concerning the transverse profile, with a correlation coefficient of 0.54 for levels 15–8 compared with a very low 0.17 for the upper levels. Regarding the relationship between length and width, the assemblages are more differentiated. The longitudinal profiles are much more defined, with a value of R2 greater than 5, and from level 15 to 1 there is a clear, specific morphological trend towards making straighter end-scrapers. The tools in levels 15–8 are shorter, with a length/width ratio usually about 1, and a rounded or sub-rounded morphology (G5 sensu Laplace). In the second group, the longitudinal profiles are straighter, and two distinct groups are present (fig. 11): one with a length/width index of about 1 (there are Romanellian types present) and the other one with a length/width ≥1,5 relative to end-scrapers made on blades (Fig. 12–13).

For armatures the selection of unretouched blanks is only concerned with the micro-bladelet sets, apart from three tools. The measure-

Tab. 4 - Typological groups (sensu Laplace) from Layer 2. / Gruppi tipologici (sensu Laplace), strato 2.

TYPOLOGICAL GROUPS	Layer2			
	15-8		7-1	
	n	%	n	%
(B) Burins	21	3.4	13	3.0
(G) End-scrapers	44	7.1	34	8.0
(T) Truncated tools	51	8.3	29	6.8
(Bc) Becs	4	0.6	1	0.2
(PD) Backed points	45	7.3	47	11.0
(LD) Backed blades	33	5.3	43	10.1
(DT) Backed blades and truncation	29	4.7	16	3.8
(Gm) Geometrics	40	6.5	30	7.0
(PD/LD/DT) fragments	103	16.3	51	11.9
(P) Points	10	1.6	6	1.4
(L) Blades	39	6.3	28	6.6
(R) Scrapers	106	17	57	13.3
(P/L/R) fragments	22	3.5	24	5.6
(A) Abrupts	10	1.6	12	9.8
(D) Denticulated	20	3.2	26	6.1
(E) Ecailles	43	6.9	28	6.6
Tot.	620	-	427	-

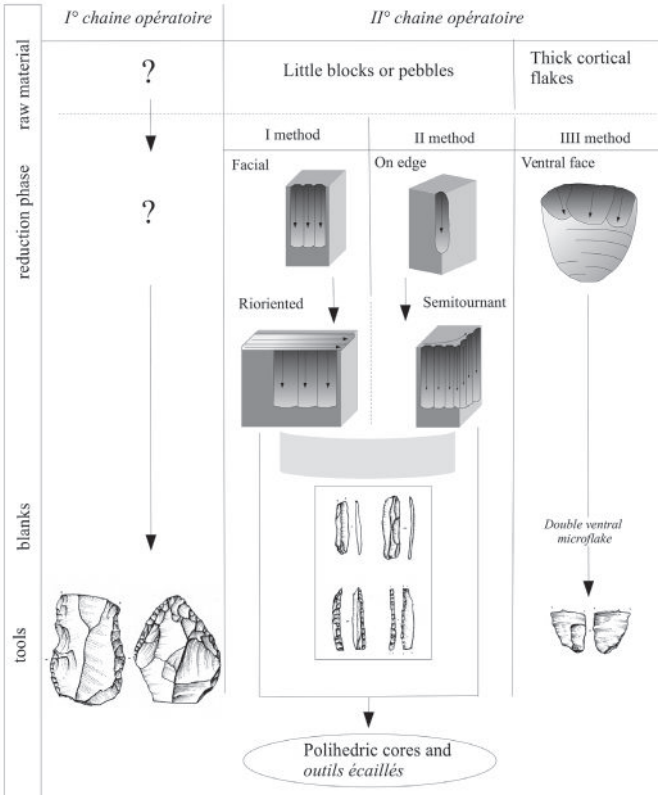

Fig. 14 *- Reduction sequences of layer 2. / Schema riassuntivo della catena operativa relativo alla strato 2.*

ments range between 4.5 and 31.5 mm for levels 15–8, and 4.5 and 24 mm for levels 7–1, with an average of 13 and 10 mm, respectively. Even though the typometrical gap between the two assemblages is significant, 200 elements from the lower sequence and 88 from the higher sequence, we presume the morphometrical differences between the sequences of Layer 2 are true. In levels 15–8 the values create a plurimodal curve with three peaks (at 6–8 mm, 10–12 mm and 22–24 mm). For levels 7–1, the graph is simpler, with a bimodal curve and a first peak at 10 mm and a second peak at 17–18 mm. The longitudinal profile of the tools also change throughout Layer 2. In levels 15–8 the correlation between length and width showed a fairly linear distribution and a very low index of correlation (0.01). In levels 7–1 the dimensions of the tools cluster around 5 mm in length and 2–3 mm in width. The values of this index tends to decrease constantly with levels 7-1, and the tools are less straight and wider. Another differential gradient between the two assemblages are indicated by the transverse morphology of tools (the width/thickness correlation). In levels 15–8 careening is quite high, around 1, in contrast to the morphology of tools in levels 7–1, which are much smaller, with a sparse and unclustered distribution of values shown in correlation graphs. We are not able to identify any clear standardization in general for armatures from a morphometrical point of view.

Typology

The typology is based on Laplace (1964) (Tab. 4), but also taking into account Broglio and Kozlowky (1983). The frequency of tools based on the essential element structure (sensu Laplace) are similar in both subsets. The general composition of the assemblage indicated a prevalence of backed pieces (RAD) and of the substratum (SUB). The burins and end-scrapers had a very low frequency. The general distribution of the primary type is similar in both subsets; only the absolute values showed variation. The burins are always less frequent than the end-scrapers, but we still noticed some differences in typological composition. In the lower part of the layer, in the burin group, the retouched types are always less frequent than the simple types, but the index is inverted in the upper part. It is important to emphasize that within the typological group of end-scrapers the short shapes are much more numerous (length/width ≤1,5) and the rounded scrapers increased in levels 7–1 (IR 9.1–17.6). The steeped retouched tools (RAD), like the truncated pieces, backed blades and points and geometric tools, are the best represented, and this class is characterized by a high frequency of truncation, principally orthogonal (IR 16.7–13.14). The backed points, most numerous in the upper part of Layer 2 (10.6%), are generally exclusively made by a total retouch (PD4); those with a bilateral total retouch (sauveterre) are present equally in both parts of the layer. The backed points are always microlithics, with the exception of one piece that came from the upper part of the layer (50 mm in length). The frequencies of the backed blades are similar to those of the backed points, but we have to emphasize the evidence of a general reduction in the absolute values of these kinds of tools in the more recent levels of the layer. The same tendency is also present with the backed and truncated pieces (DT). In this group, the orthogonal shapes are the most common, as for the truncated pieces. The geometric tools (Gm) has a very important role in the cultural attribution of Layer 2. They showed an increase in frequency in levels 7–1 (IR Gm 12.2–13.8). The triangle is the most common geometric tool, followed by segments (Gm1), which are more common in levels 15–8. Within the triangles we recorded a predominance of the scalene type (Gm3/Gm4 1.5–1.3) in both sets. Also within this type shorter shapes are clearly much more frequent than longer shapes; the rare long-type triangle is only found within the scalene type. The substratum has frequencies too much elevated (40.3%). From a quantitative point of view, the best represented tools are the short scrapers (17.0%–12.0%) followed by the écailles tools and the longer scrapers (blades); points are very rare. We did not notice any particular variation concerning the frequencies of tools classified in the substratum.

Reduction sequences

The reconstruction of the chaine operatoires and the identification of the objectives of the debitage, and the process of selection, retouching and use of the lithic assemblage, was possible because of the integration of technological, morphological and typometrical analyses of retouched and unretouched artifacts. The results identities two principal reduction sequences and three further processes that are usually interrelated (Fig. 13). In general the type of lithic artifact production present at Grotta delle Mura fits perfectly with what has been defined as the pragmatic style of debitage, namely a lithic assemblage characterized by a low degree of standardization of unretouched blanks (lamellar or not) accompanied by intensive retouch activity and microburin technique (Fontana & Guerreschi 2009; Flor et al. 2011). Two chaines operatoires are present, albeit not represented in detail in every step. The first reduction sequence is only evidenced at the site by the presence of finished retouched tools; it is based on the production of lamellar blanks with a length of more than 60 mm and relatively thick. The element seems to be present at the site as finished tools, and then abandoned. From a typological point of view they are elements of the substratum, such as points, blade and scrapers (sensu Laplace). The second reduction sequence is represented at every step and show three types of production process. The first two processes start with small blocks/slab of good-quality flint, more common in levels 7–1 as pebbles. The objective was to obtain small lamellar, micro-lamellar and iper-micro-lamellar blanks. The first process involved an initial, rather simple, exploitation of the core volume, with a sequence of three or four detachments, starting with bladelets with a natural dihedral profile, without any particular preparation of the core surface (crested blade). The debitage continues with a re-orientation of the core surfaces useful for the knapping activity. The second process shows a more intensive initial exploitation of the core volume,

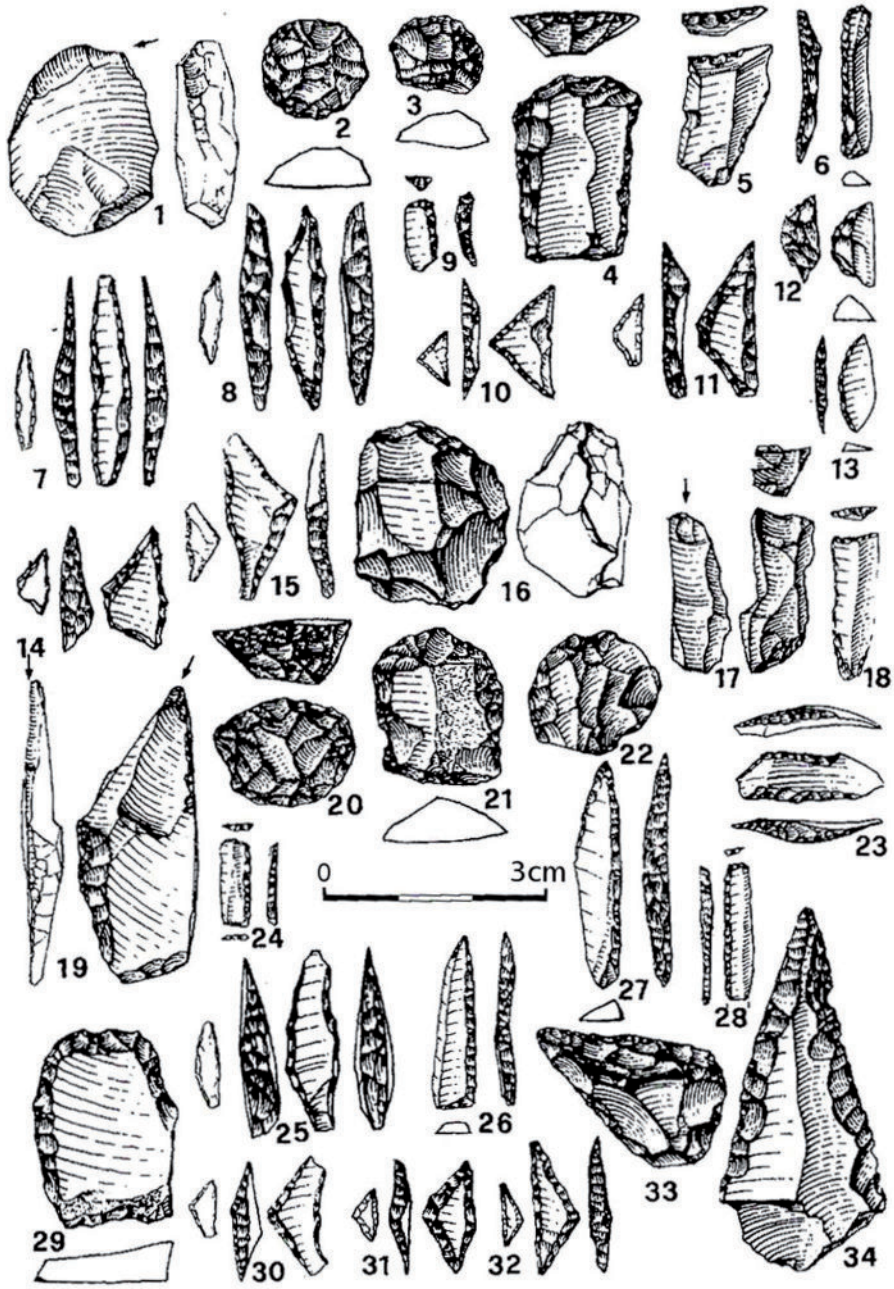

Fig. 15 *- Retouched tools of layer 2. Burins (1,17,19), end-scrapers (2-4, 20-22), truncated pieces (5,18), backed tools (DT, PD and LD)(6-9, 24-28), geometrics (10-15, 30-32), point (34), scrapers (19, 23, 33), core (16) (Drawings by G. Fabbri). / Strumenti, strato 2 di Grotta delle Mura. Bulini (1, 17, 19), grattatoi (2 – 4, 20 – 22), Troncature (5, 18), punte a dorso, lame a dorso, dorsi e troncatura (6 – 9, 24 – 28), geometrici (10 – 15, 30 – 32), punta (34), raschiatoi (19, 23 e 33), nucleo (16) (Disegni di G. Fabbri).*

starting with a facial sequence, and later, sometimes, following a sequence of lamellar detachment using a semi-tournant method. The volumetric exploitation tends to reach a limit with both methods, and the continuous re-orientation of the knapping surfaces tends to transform the morphology of the core by the end of the reduction sequence to a polyhedral shape or to an ecailles–cores . The end of the reduction sequence results in the production of microlithic blanks, rarely with a lamellar morphology. The third process, in contrast, is dedicated to the exploitation of flakes, usually cortical flakes and always thick, useful for the production of very thin, small flakes (maximum dimension usually around 15–20 mm), from the ventral face of the flake core. The sequence of debitage can be centripetal or bipolar, usually very short (three flakes), not very intensive, without any clear preparation of core morphology, just a rapid rectification of the debitage plane contraposed to the platform or lateral to it.

Conclusion

The Italian context indicates a Mesolithic regionalisation, both in the Sauveterrian period and in the Castelnovian. Lithic industries from the South-central part of the Italian peninsula can be strongly differentiated from the typical Sauveterrian Alpine. The Central Italy (Isola Santa, Levane-Bandella) (Kozlowski et. al. 2003; Magi 2008) is characterized by a very low presence of backed knives, no tectiform end-scrapers, some present the shape of scalene triangles with

Tab. 5 - Typological comparison between Grotta delle Mura and Marisa (sensu Broglio & Kozlowski). / Comparazione degli indici tipologici (sensu Broglio & Kozlowski) tra Grotta delle Mura e Grotta Marisa.

COMMON TOOLS	GR. DELLE MURA			MARISA
	15-8	7-1	TOT.	
(A) End-scrapers	13.8 %	17.3 %	15.2 %	31.9 %
(B) Retouched flakes	33.3 %	29.1 %	31.7 %	31.3 %
(C) Burins	6.6 %	6.6 %	6.0 %	2.1 %
(D) Truncated tools	16.0 %	14.8 %	15.6 %	2.7 %
(E) Retouched blades	12.3 %	14.3 %	13.0 %	15.8 %
(F) Becs	1.3 %	0.5 %	1.0 %	1.9 %
(G) Backed knives	-	-	-	-
(H) Points	3.1 %	3.1 %	3.1 %	1.2 %
(J) Ecailles	13.5 %	14.3 %	13.8 %	13.1 %
(O) Backed points	30.3 %	49.7 %	54.8 %	32.7 %
(P) Segments	1.5 %	5.4 %	3.5 %	2.0 %
(Q) Backed truncated	11.8 %	19.7 %	15.9 %	4.0 %
(R) Triangles	20.6 %	21.8 %	21.2 %	41.6 %
(S) P. Sauveterre	5.9 %	3.4 %	4.6 %	17.3 %
(T) Trapezoids	-	-	-	-
Common tools	318	196	514	250
Armatures	136	147	283	202
Tot.	454	343	767	452

short base and Montclus type. In southern Italy, there are different realities simultaneously, such as a local Mesolithic sauveterrianized (Grotta Marisa, Grotta delle Mura), the Epi-romanellian (Grotta del Cavallo) and the Mesolitico indifferenziato of Grotta della Serratura (Martini 1993: Martini 1996).

This study was carried out to confirm the correlation of Layer 2 of Grotta delle Mura with the sauveterrianized mesolithic of south Italy. From a typological point of view (Tab. 5) the lithic assemblage does not seem to show any significant variation in structure in the lower and upper parts of the layer, with the exclusion of the index for retouched burins/simple burins and the increase in rounded and short types of end-scrapers in levels 7–1. It is important to take into account the typical Sauveterrian technology that characterizes this lithic industry (discoidal cores, pragmatic reduction sequence, microlithics, etc.). A focus for retouched tools has a strong legacy within the Epigravettian culture (final Epigravettian) and is also demonstrated here (Romanellian end-scrapers, backed and truncated pieces, etc.). This kind of relationship is also documented by the mobiliary art objects present at the site, which show a strong relationship with the Epi-Romanellian context. The permanence of the Epigravettian cultural tradition has been highlighted in one study (Calattini 1996b) and was recently reconsidered by another (Kozlowski 2009). These aspects make Layer 2 a peculiar cultural reality of the Mesolithic.

The only site where it is possible to make an in-depth comparison with Grotta delle Mura (because of its geographical proximity) is Grotta Marisa, in south Apulia (Lecce) (Astuti et al. 2005). There are many cultural and paleo-environmental points of contact. The most important are the mobiliary art decorative patterns and an almost perfect correlation of the typological analyses of the lithic assemblages. However, it is also at this level that some important divergences occur, and they give us cause to consider the hypothesis of two different chronological contexts. Within the common tools (Broglio & Kozlowski 1983) at Grotta delle Mura there is a lower frequency of end-scrapers and burins, and within the armatures there is a higher quantity of backed points and backed-truncated pieces (Tab. 5). Despite the lack of radiometric data at Grotta Marisa, and assuming the Sauveterrian presents a progressive acquisition model, the much higher presence of Epigravettian elements at Mura cave could be considered from a chronological point of view to indicate a more ancient Mesolithic occurrence.

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